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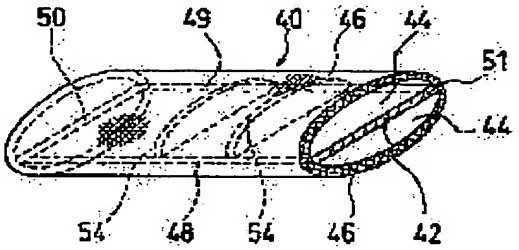
(71)Applicant : TOYOTA MOTOR CORP
(72)Inventor : NISHIMURA YASUHIKO

(54) NOISE ABSORPTION EQUIPMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a noise absorption equipment capable of providing a high effect with a minimum quantity of sound absorbing material.
SOLUTION: This noise absorption equipment is provided with a base plate 42 consisting of a substantially square plane plate having four edges, and a sound absorbing material 46 arranged extending over two opposed edges 48, 49 of the base plate and situated on at least one side of the base plate through an air layer 44. The sound absorbing material is made into a curved form in which it is curved from each of the two edges toward the center part of the two edges so as to be gradually separated from the base plate, and the curved form extends between the two remaining edges 50, 51.



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審査請求　未請求　請求項の数６　ＦＤ　（全９頁）

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(71)出願人　000003207
トヨタ自動車株式会社
愛知県豊田市トヨタ町１番地

(72)発明者　西村　靖彦
愛知県豊田市トヨタ町１番地　トヨタ自動車株式会社内

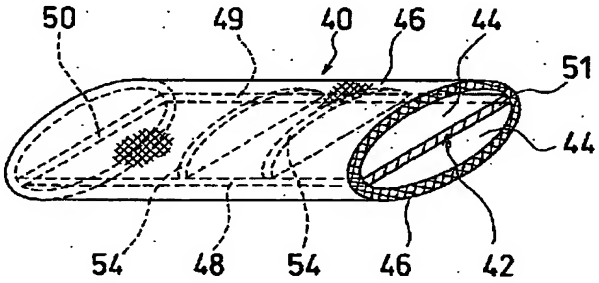
(74)代理人　弁理士　松永　宣行

(54)【発明の名称】　吸音装置

(57)【要約】

【課題】　最少量の吸音材で高い効果を奏することができる、吸音装置を提供すること。

【解決手段】　吸音装置は、平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板（４２）と、この基板の対向する２つの辺（４８，４９）にわたって配置され、基板の少なくとも片側に空気層（４４）を介在して位置する吸音材（４６）とを備える。この吸音材は、前記２つの辺のそれぞれからこれら２つの辺間の中央に向くにつれて基板から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺（５０，５１）間に伸びている。



【特許請求の範囲】
【請求項１】　平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板と、
この基板の対向する２つの辺にわたって配置され、前記基板の少なくとも片側に空気層を介在して位置する吸音材とを備え、
この吸音材は、前記２つの辺のそれぞれからこれら２つの辺間の中央に向くにつれて前記基板から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺間に伸びている、吸音装置。
【請求項２】　平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板と、
この基板の対向する２つの辺の１つから他の辺の上方又は下方に向けて配置され、前記基板の少なくとも片側に空気層を介在して位置する吸音材とを備え、
この吸音材は、前記２つの辺の１つから他の辺に向くにつれて前記基板から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺間に伸びている、吸音装置。
【請求項３】　板材からなる基板と、
この基板の周縁から盛り上げられ、前記基板の少なくとも片側に空気層を介在して位置する吸音材とを備え、
この吸音材は、前記周縁から中央に向くにつれて前記基板から次第に離れるように湾曲された、吸音装置。
【請求項４】　周囲部及び底部に板材を配置し、頂部を開口として形成された複数のセルと、
各セルの前記開口に配置された吸音材とを備え、
この吸音材は、この吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ前記底部から離され、前記開口は前記波長と比べて小さくなるように形成された、吸音装置。
【請求項５】　周囲部に板材を配置し、頂部及び底部を開口として形成された複数のセルと、
各セルの前記開口にそれぞれ配置された吸音材とを備え、
前記頂部の吸音材と前記底部の吸音材とは、これら吸音材によって吸収すべき音の波長の実質的に２分の１に相当する距離だけ離され、前記開口は前記波長と比べて小さくなるように形成された、吸音装置。
【請求項６】　周囲部と底部とに板材を配置すると共に、頂部に開口を有する板材を配置して断面形状が実質的に円形を呈するように形成されたセルであって、前記頂部の開口の近傍で前記頂部から垂下し、かつ、前記周囲部から半径方向へ中心まで伸びる仕切材を有し、前記開口から入った音が円周方向へ伝播して前記仕切材で反射し、前記開口に戻るように形成された複数のセルと、
各セルの前記開口に配置された吸音材とを備え、
前記セルの前記開口と前記仕切材とは、前記吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ離され、前記開口は前記波長と比べて小さくなるように形成された、吸音装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は吸音装置に関し、例えば、自動車のエンジンを囲んでエンジンからの音を吸音したり、高速道路に沿って配置して走行する自動車騒音を吸音したり、建物の壁に取り付けて建物の内部に進入する音又は外部に漏れる音を吸音したりするのに適する吸音装置に関する。
【０００２】
【従来の技術】エンジンの周りを囲む遮蔽板に空隙部を設けると共に、遮蔽板の内側に凸状に湾曲された吸音材を取り付けた吸音装置が提案されている（実開平3-110959号公報）。
【０００３】
【発明が解決しようとする課題】前記吸音材は充実タイプであるため、所定の効果をうるには相当量の吸音材が必要となり、コスト的に不利である。
【０００４】本発明は、最少量の吸音材で高い効果を奏することができる、吸音装置を提供する。
【０００５】
【課題を解決するための手段、作用及び効果】本発明に係る吸音装置は、平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板と、この基板の対向する２つの辺にわたって配置され、前記基板の少なくとも片側に空気層を介在して位置する吸音材とを備える。この吸音材は、前記２つの辺のそれぞれからこれら２つの辺間の中央に向くにつれて前記基板から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺間に伸びている。
【０００６】音波が吸音材と交差する方向から吸音材に達するとき、音波は吸音材を通過し、空気層を経て基板に達する。その後、基板で反射して再び空気層を経て吸音材に達し、再び吸音材を通過する。一方、音波が接線方向から吸音材に入るとき、音波は吸音材の内部を伝播した後、吸音材から出る。
【０００７】基板と吸音材との間に空気層があるため、吸音材の使用量を少なくすることができる。ところで、吸音材の吸音効果は、吸音材内を通過する音波の粒子速度が速いほど高くなり、また吸音材内の通過距離が長いほど高くなる。したがって、吸音材の湾曲形状のうち、基板から最も高くなる部位で音波の粒子速度が最も速くなるように湾曲形状を定め、音源からの音波が吸音材の最も高くなる部位に実質的に法線方向から入るように吸音装置を設置することによって最も高い吸音効果をうることができる。また、接線方向から吸音材に入る音波が可及的に長く吸音材内を伝播するように吸音材を滑らかに湾曲することによっても高い吸音効果をうることができる。
【０００８】吸音材が２つの辺のそれぞれからこれら２

つの辺間の中央に向くにつれて基板から次第に離れるように湾曲されているため、滑らかな湾曲とすることができる。これによって、吸音材を通過して基板で反射した音波が基板から再び吸音材に達するまでの距離を、音波の粒子速度が最も速くなる距離に近づけ易いことと、湾曲形状が基板の残る２つの辺間に伸びていることから、広い範囲にわたって良好な吸音効果をうることができる。

【０００９】本発明に係る吸音装置はまた、平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板と、この基板の対向する２つの辺の１つから他の辺の上方又は下方に向けて配置され、前記基板の少なくとも片側に空気層を介在して位置する吸音材とを備える。この吸音材は、前記２つの辺の１つから他の辺に向くにつれて前記基板から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺間に伸びている。

【００１０】吸音材が２つの辺にわたっている吸音装置と実質的に同じ作用及び効果を奏するが、この発明ではさらに、音源が一個所に定まっている場合に吸音材の無駄を排して効果的に吸音できる。

【００１１】本発明に係る吸音装置はまた、板材からなる基板と、この基板の周縁から盛り上げられ、前記基板の少なくとも片側に空気層を介在して位置する吸音材とを備える。この吸音材は、前記周縁から中央に向くにつれて前記基板から次第に離れるように湾曲されている。

【００１２】基板が方形、円形又は楕円形その他の形状であり、比較的小さい場合には、基板の周縁から吸音材を盛り上げて吸音装置を作り、このような独立した吸音装置を単独で又は複数並べて吸音する。

【００１３】独立した複数の吸音装置を使用する場合、その配列を任意に選定できることから、音源に応じた吸音がし易くなる。また、個々の吸音装置の吸音材は前記発明と同様に、吸音材を通過する音波に対しても、また吸音材を伝播する音波に対しても有効であり、良好に吸音することができる。

【００１４】本発明に係る吸音装置はまた、周囲部及び底部に板材を配置し、頂部を開口として形成された複数のセルと、各セルの前記開口に配置された吸音材とを備える。この吸音材は、この吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ前記底部から離され、前記開口は前記波長と比べて小さくなるように形成されている。

【００１５】波長と比べて小さい断面のセル中を通過する音波は周囲部で反射を起こすことなく直進し、平面波となる。したがって、吸音材を通過してセル中の空気層を経て底部に達した音波は、底部のみで反射して再び空気層を経て吸音材に達し、ここを通過する。

【００１６】吸音材は、この吸音材が吸収すべき音の波長の実質的に４分の１に相当する距離だけ底部から離れているが、この距離は音波が腹となって振動する個所であり、底部で反射した音波の粒子速度が最も速くなる個所であって、音波のエネルギが最も高いところである。吸音材はその最も高いエネルギを効果的に減衰することとなり、良好に吸音することができる。また、吸音材は空気層を介在して位置するため、その量を少なくすることができる。

【００１７】本発明に係る吸音装置はまた、周囲部に板材を配置し、頂部及び底部を開口として形成された複数のセルと、各セルの前記開口にそれぞれ配置された吸音材とを備える。前記頂部の吸音材と前記底部の吸音材とは、これら吸音材によって吸収すべき音の波長の実質的に２分の１に相当する距離だけ離され、前記開口は前記波長と比べて小さくなるように形成されている。

【００１８】音波はセルの周囲部で反射を起こすことなく直進し、平面波となる。したがって、頂部の吸音材を通過してセル中の空気層を経て底部の吸音材に達した音波は、その一部が底部の吸音材のみで反射し、残部が底部の吸音材を通過する。底部の吸音材で反射して再び空気層を経て頂部の吸音材に達した音波は、ここを通過する。

【００１９】頂部及び底部の吸音材は、これら吸音材が吸収すべき音の波長の実質的に２分の１に相当する距離だけ互いに離れているが、この場合、音波は頂部及び底部で腹となる振動をし、粒子速度がその腹で最も速くなる。その結果、頂部及び底部の吸音材は、音波の最も高いエネルギを効果的に減衰することとなり、良好に吸音することができる。また、吸音材は空気層を介在して位置するため、その量を少なくすることができる。

【００２０】本発明に係る吸音装置はまた、周囲部と底部とに板材を配置すると共に、頂部に開口を有する板材を配置して断面形状が実質的に円形を呈するように形成されたセルであって前記頂部の開口の近傍で前記頂部から垂下し、かつ、前記周囲部から半径方向へ中心まで伸びる仕切材を有し、前記開口から入った音が円周方向へ伝播して前記仕切材で反射し、前記開口に戻るように形成された複数のセルと、各セルの前記開口に配置された吸音材とを備える。前記セルの前記開口と前記仕切材とは、前記吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ離され、前記開口は前記波長と比べて小さくなるように形成されている。

【００２１】波長と比べて小さい開口を有する円形のセル中を通過する音波は周囲部で反射を起こすことなく直進し、平面波となることが期待できる。したがって、吸音材を通過してセル中の空気層を経て仕切材に達した音波は、仕切材のみで反射して再び空気層を経て吸音材に達し、ここを通過する。

【００２２】吸音材は、この吸音材が吸収すべき音の波長の実質的に４分の１に相当する距離だけ仕切材から離れているが、この距離は音波が腹となって振動する個所

であり、仕切材で反射した音波の粒子速度が最も速くなる個所であって、音波のエネルギが最も高いところである。吸音材はその最も高いエネルギを効果的に減衰することとなり、良好に吸音することができる。また、吸音材は空気層を介在して位置するため、その量を少なくすることができる。

【００２３】

【発明の実施の形態】まず、本発明の原理を模式的な図１及び図２を参照して説明する。Ａ方向に進行している音波の入射波Ｂが吸音材３０に達すると、入射波Ｂは吸音材３０を通過し、空気層３２を経て基板３４に達する。その後、入射波Ｂは基板３４で反射して反射波Ｃとなり、再び空気層３２を経て吸音材３０に達し、吸音材３０を通過する。音波が基板３４で反射するとき、その音波は、基板３４から波長λの４分の１に相当する個所に振動の腹がくるように振動し、腹における音波の粒子速度は最も速くなる。これは音波が大きなエネルギを持っていることであるから、ここで音波を吸音材３０に通過させれば、音波に大きな減衰をさせることができる。

【００２４】次に、Ｄ方向に進行している音波が吸音材３０に接線方向から入射すると、音波は、吸音材３０が滑らかに湾曲しているならば、吸音材３０内を伝播する。したがって、音波が吸音材３０内を可及的長く進行するように吸音材３０の湾曲形状を定めれば、音波に大きな減衰をさせることができる。通常、円弧がこれに適する。

【００２５】図２に示すように、Ａ方向へ進行している音波の入射波Ｂが吸音材３６を通過し、さらに音波の波長と比べて小さい断面のセル３７中を通過するとき、入射波はセル３７の周囲部で反射を起こすことなく直進し、平面波となる。したがって、吸音材３６を通過してセル中の空気層３９を経て底部３８に達した入射波Ｂは、底部３８のみで反射して反射波Ｃとなり、再び空気層３９を経て吸音材３６に達する。音波が底部３８で反射するとき、その音波は、前述したように、底部３８から波長λの４分の１に相当する個所に振動の腹がくるように振動し、腹における音波の粒子速度は最も速くなる。これは音波が大きなエネルギを持っていることであるから、ここで音波を吸音材３６に通過させれば、Ａ方向に進行する音波に大きな減衰をさせることができる。

【００２６】吸音装置４０は、断面状態の図３及び斜視状態の図４を参照すると、平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板４２と、基板４２の対向する２つの辺にわたって配置され、基板４２の少なくとも片側に空気層４４を介在して位置する吸音材４６とを備える。

【００２７】図示の実施例では、基板４２は長方形の硬質の板材からなり、４つの辺４８，４９，５０，５１を有する。基板４２はポリプロピレンのような硬質樹脂又は鋼板、アルミニウム板のような金属で作ることができる。２つの吸音材４６が、２つの辺４８，４９にわたって配置されている。各吸音材４６は、２つの辺４８，４９のそれぞれからこれら２つの辺間の中央に向くにつれて基板４２から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺５０，５１間に伸びている。すなわち、２つの辺５０，５１間では吸音材４６はどの部位でも実質的に同じ形状である。２つの吸音材４６は基板４２に対して対称形状であり、基板４２を弦とした円弧となっている。吸音材４６は、グラスウールのようなそれ自体公知の材料を成形し、適当に接着して形状を維持できるように形成されたもので、基板４２に接着又はねじ止めされる。吸音材４６として、フェルト又はウレタンのようなものを使用することもできる。吸音材４６の厚みは、例えば10-30㎜ 程度に定めることができる。

【００２８】吸音材４６は、基板４２から最も離れた部位における吸音材の厚みの中央が基板４２の表面からλ／４の距離となるように寸法を定めてある。ここで、λは吸音材４６で吸収すべき音の波長である。吸音材４６と基板４２との間の空気層４４に複数の仕切板５４を、これら仕切板が２つの辺５０，５１間に等間隔に配置されるように取り付けることが好ましい。仕切板５４は、硬質樹脂又は金属で作ることができる。これは吸音材４６の形状維持機能と、音の流れを整える機能とを果たす。

【００２９】図５に断面状態で示した吸音装置６０は、平面形状が実質的に方形を呈し、４つの辺を有する板材からなる基板６２と、この基板の対向する２つの辺６８，６９のうちの１つ６８から他の辺６９の上方又は下方に向けて配置され、基板６２の少なくとも片側に空気層６４を介在して位置する吸音材６６とを備える。基板６２は図４の基板４２と同様に長方形のものである。

【００３０】図示の実施例では、２つの吸音材６６が基板６２の上方及び下方に配置されている。各吸音材６６は、基板６２の２つの辺６８，６９のうちの１つの辺６８から他の辺６９に向くにつれて基板６２から次第に離れるように湾曲された湾曲形状に形成され、この湾曲形状が残りの２つの辺間、つまり図５の紙面に垂直な方向に伸びている。辺６９側における基板６２の表面から吸音材６６の厚みの中央までの距離は、λ／４となるように寸法を定めてある。ここで、λは吸音材６６で吸収すべき音の波長である。基板６２や吸音材６６は、前述したものと同様の材料によって形成できる。

【００３１】斜視状態で示した図６の吸音装置７０は、板材からなる基板７２と、基板７２の周縁から盛り上げられ、基板７２の少なくとも片側に空気層７４を介在して位置する吸音材７６とを備える。吸音材７６は、前記周縁から中央に向くにつれて基板７２から次第に離れるように湾曲されている。基板７２や吸音材７６は、前述したものと同様の材料によって形成できる。

【００３２】図示の実施例では、基板７２は円盤であり、吸音材７６は基板７２の上方で丸屋根状すなわちドーム状となっている。吸音材７６が基板７２からもっとも離れた部位において基板７２から吸音材７６の厚みの中央までの距離は、λ/４となるように寸法を定めてある。ここで、λは吸音材７６で吸収すべき音の波長である。基板７２は円盤に代えて、方形、楕円形その他の形状とすることができる。図３ないし図５に示した吸音装置では、吸音材の湾曲形状がある長さにわたって連なっているのに対し、図６の吸音装置では、そのような連なりはない。

【００３３】吸音装置４０は、図７ないし図１３に示すように配列して使用することができる。正面状態を示す図７及び平面状態を示す図８を参照すると、吸音装置４０は、エンジン８０からの音を吸音すべくエンジンルーム８２内に配置されている。エンジン８０の左側及び右側にそれぞれ上下３列に吸音装置４０を配列しているが、左側の配列と右側の配列とは、基板４２がエンジン８０に対して上向きとなるように吸音装置４０を斜めにし、対称となっている。さらに、エンジン８２の前後にも吸音装置４０を配置してある。

【００３４】正面状態を示す図９を参照すると、吸音装置４０は音源８４からの音を吸音すべく囲み８６内に配置されている。音源８４の左側及び右側にそれぞれ上下３列に吸音装置４０を配列しているが、左側の配列と右側の配列とは、基板４２が水平となるように吸音装置４０を水平にし、対称となっている。

【００３５】正面状態を示す図１０を参照すると、吸音装置４０は音源８４からの音を吸音すべく囲み８６内に配置されている。音源８４の左側及び右側にそれぞれ上下３列に吸音装置４０を配列しているが、左側の配列と右側の配列とは、基板４２が音源８４に対して下向きとなるように吸音装置４０を斜めにし、対称となっている。

【００３６】正面状態を示す図１１を参照すると、吸音装置４０は音源８８からの音を吸音すべく囲み９０内に配置されている。音源８８の左側及び右側にそれぞれ１列に吸音装置４０を配列しているが、左側の配列と右側の配列とは、基板４２が音源８８を対して上向きとなるように吸音装置４０を斜めにし、対称となっている。

【００３７】正面状態を示す図１２を参照すると、音源９２はエンジンの下側にあるオイルパンであり、吸音装置４０Ａはオイルパン９２の左右の側部にそれぞれ１列に配置されている。吸音装置４０Ａは吸音装置４０を変更した形態であり、基板４２Ａと、空気層４４と、吸音材４６Ａとを備える点で吸音装置４０と同じであるが、基板４２Ａがゴム質材料で形成されている点で異なる。基板４２Ａがゴム質材料であることから、吸音装置４０Ａは全体にたわみ性を有する。そのため、図示の実施例では、吸音装置４０Ａの全体を曲げ、吸音材４６Ａをオイルパン９２に接触させて配置してある。吸音装置４０Ａの下側にパンチングメタル９４を配置して吸音装置４０Ａを保護することが好ましい。

【００３８】正面状態を示す図１３を参照すると、音源９２はオイルパンであり、吸音装置４０はオイルパン９２の左右の側部にそれぞれ１列に、基板４２が水平となるように配置されている。吸音装置４０の下側にパンチングメタル９４を配置することが好ましい。

【００３９】吸音装置６０は、正面状態を示す図１４を参照すると、音源９６に対して対称となるように音源９６の左右の側部にそれぞれ１列に、基板６２が水平となるように配置されている。音源９６が比較的小さい場合には、吸音装置６０を使用することによって、吸音装置４０を使用する場合と比べて吸音材の量を減らすことができる。図１４と図１３とを比べてみると、吸音装置６０は吸音装置４０のほぼ半分の大きさにしうることが分かる。

【００４０】正面状態を示す図１５を参照すると、吸音装置６０Ａは吸音装置６０を変更した形態であり、基板６２と、空気層６４と、吸音材６６とを備える点で吸音装置６０と同じであるが、吸音装置６０Ａでは吸音材６６は基板６２の下方のみに設けられている。吸音装置６０Ａは音源９６に対して対称となるように音源９６の左右の側部にそれぞれ１列に、基板６２が水平となり、吸音材６６が下側となるように配置されている。

【００４１】図１４及び図１５の配置に代えて、図７及び図９ないし図１１に示した配置にすることが可能であり、さらに基板６２をゴム質材料で作ることによって図１２の配置とすることもできる。

【００４２】吸音装置７０は、例えば自動車専用道路沿いに建てられる防音壁に基板７２を防音壁に密接させた状態で取り付け、このような吸音装置を道路に沿って多数配列し、さらに防音壁の上下方向へ複数列に配列して使用することができる。

【００４３】斜視状態の図１６及び断面状態の図１７に示した吸音装置１００は、周囲部及び底部に板材を配置し、頂部を開口として形成された複数のセル１０２と、各セルの前記開口に配置された吸音材１０４とを備える。吸音材１０４は、この吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ底部から離されている。そして、前記開口は前記波長と比べて小さくなるように形成されている。

【００４４】図示の実施例では、セル１０２は周囲部１０６を四角筒にして底部１０７を取り付けた形態である。このようなセル１０２を水平方向へ２次元的に配列し、頂部の開口に吸音材１０４を配置して吸音装置１００が形成されている。吸音材１０４は、底部１０７の表面から吸音材１０４の厚みの中央までの距離が波長λの４分の１となるように位置している。周囲部１０６と底部１０７とは、硬質樹脂を射出成形して得ることができ

る。セル１０２の周囲部１０６の１辺の長さは、たとえば音速を340m/ｓ、吸音材で吸収すべき音の周波数を1000Hzとした場合、その音の波長が34cmであるから、波長の５分の１ないし１０分の１程度に定めることができる。

【００４５】吸音材１０４は、この吸音材によって吸収すべき音の波長λの実質的に４分の１に相当する距離だけ底部から離されているが、この寸法は、開口の形状に応じて次のように定めることができる。図１８に示すように、セル１０８が斜めの開口を有する場合、吸音材１１０は斜めに配置される。この場合には、吸音材１１０の長さの中間点が底部１０９から前記距離にあればよい。同図（ｃ）のように中間セル１１２がある場合には、この中間セル１１２に設ける吸音材１１４は前記距離から外れるが、両側のセル１０８に取り付ける吸音材１１０は前記距離に定める。図１９に示すように、セル１１６を形成する周囲部１１８が底部１１９から傾いて伸びている場合、吸音材１２０は、周囲部１１８の実長、つまり底部１１９から吸音材１２０に至る周囲部１１８の長さが前記距離となるように定める。

【００４６】断面状態の図２０に示した吸音装置１３０は、周囲部１３２及び底部１３３に板材を配置し、頂部を開口として形成された複数のセル１３４と、各セルの前記開口に配置された吸音材１３６とを備える。吸音材１３６は、この吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ底部１３３から離されている。そして、前記開口は前記波長と比べて小さくなるように形成されている。吸音装置１３０は全体に円筒状であり、図２０の紙面に垂直な方向へ伸びている。そして、セル１３４は、同図（ａ）の周方向だけでなく、紙面に垂直な方向においても周囲部１３２によって区切られている。周囲部１３２は、断面が三角形状に形成されており、開口が尖端となっている。

【００４７】断面状態の図２１に示した吸音装置１４０は、周囲部１４２及び底部１４３に板材を配置し、頂部を開口として形成された複数のセル１４４と、各セルの前記開口に配置された吸音材１４６とを備える。吸音材１４６は、この吸音材によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ底部１４３から離されている。そして、前記開口は前記波長と比べて小さくなるように形成されている。吸音装置１４０は全体に円筒状であり、図２１の紙面に垂直な方向へ伸びている。そして、セル１４４は、同図（ａ）の周方向だけでなく、紙面に垂直な方向においても周囲部１４２によって区切られている。周囲部１４２は、断面が実質的に楕円形状に形成されている。図２０及び図２１の吸音装置ではセルの開口が大きくなっているため、音が吸音装置に入りやすい。

【００４８】断面状態の図２２に示した吸音装置１５０は、周囲部１５２に板材を配置し、頂部及び底部を開口として形成された複数のセル１５４と、各セルの前記開口にそれぞれ配置された吸音材１５６とを備える。頂部の吸音材１５６と底部の吸音材１５６とは、これら吸音材によって吸収すべき音の波長の実質的に２分の１に相当する距離だけ離され、前記開口は前記波長と比べて小さくなるように形成されている。セル１５４は、図１６に示した吸音装置１００のセル１０２のように平面的に多数並べられる。この形態では、一方の吸音材を通過した音波は２つの吸音材１５６に振動の腹がくる振動となるため、２つの吸音材１５６間を前記した距離に定めることにより、最も速くなった音波の粒子速度が持つエネルギを有効に吸収できる。

【００４９】断面状態の図２３に示した吸音装置１６０は、周囲部１６２と底部１６３とに板材を配置すると共に、頂部に開口を有する板材１６４を配置して断面形状が実質的に円形を呈するように形成された複数のセル１６６と、各セルの開口に配置された吸音材１６８とを備える。セル１６６は、前記板材１６８の開口の近傍で板材１６８から垂下し、かつ、周囲部１６２から半径方向へ中心まで伸びる仕切材１６７を有し、前記開口から入った音が円周方向へ伝播して仕切材１６７で反射し、前記開口に戻るように形成されている。セル１６６の前記開口と仕切材１６７とは、吸音材１６８によって吸収すべき音の波長の実質的に４分の１に相当する距離だけ離され、前記開口は前記波長と比べて小さくなるように形成されている。この態様では、吸音装置１６０は全体に円筒状に形成されている。セル１６６の断面形状が円形であり、底部１６３が円の中心に位置することから、底部１６３から周囲部１６２に至る距離の中間点における円周方向長さが波長の４分の１となるように定めることができる。

【００５０】図１６に示した吸音装置１００は、図２４のように配置して使用できる。同図（ａ）では、吸音装置１００はエンジン１７０の各側部でエンジンルーム１７２内に水平に配置され、吸音材１０４が路面１７４に対面するように位置している。同図（ｂ）では、吸音装置１００はエンジン１７０の各側部でエンジンルーム１７２内に斜めに配置され、吸音材１０４がエンジン１７０と路面１７４とに傾いて対面するように位置している。同図（ｃ）では、吸音装置１００はエンジン１７０の各側部でエンジンルーム１７２内に鉛直に配置され、吸音材１０４がエンジン１７０に対面するように位置している。

【００５１】円筒状吸音装置１３０，１４０，１６０は図２４と同様に配置することができる。この場合、その軸線が車体の前後方向、車体の幅方向又は鉛直方向となるように吸音装置を配置し、このような吸音装置を前後方向へ複数配列することができる。また、軸線が車体の前後方向又は幅方向となるように配置する場合、上下方向又は鉛直方向に複数列に配列することができる。

【図面の簡単な説明】

【図１】本発明に係る吸音装置の原理を模式的に示した断面図である。

【図２】本発明に係る吸音装置の別の原理を模式的に示した断面図である。

【図３】本発明に係る吸音装置の実施例の断面図である。

【図４】図３に示した吸音装置の斜視図である。

【図５】本発明に係る吸音装置の別の実施例を示す断面図である。

【図６】本発明に係る吸音装置のさらに別の実施例を示す斜視図である。

【図７】吸音装置の配置例を示す正面図である。

【図８】図７に示した配置例の底面図で、縮小して示してある。

【図９】吸音装置の別の配置例を示す正面図である。

【図１０】吸音装置のさらに別の配置例を示す正面図である。

【図１１】吸音装置のさらに別の配置例を示す正面図である。

【図１２】吸音装置のさらに別の配置例を示す正面図である。

【図１３】吸音装置のさらに別の配置例を示す正面図である。

【図１４】吸音装置のさらに別の配置例を示す正面図である。

【図１５】吸音装置のさらに別の配置例を示す正面図である。

【図１６】本発明に係る吸音装置のさらに別の実施例を示す斜視図である。

【図１７】図１６に示した吸音装置の断面図である。

【図１８】図１６に示した吸音装置の開口と吸音材との別の例を示す断面図で、（ａ）ないし（ｃ）は異なる態様を示している。

【図１９】図１６に示した吸音装置の変形例を示す断面図である。

【図２０】本発明に係る吸音装置のさらに別の実施例を示す断面図で、（ａ）は直線状に展開して拡大したもの、（ｂ）は軸線に直交する断面で切断したものである。

【図２１】本発明に係る吸音装置のさらに別の実施例を示す断面図で、（ａ）は直線状に展開して拡大したもの、（ｂ）は軸線に直交する面で切断したものである。

【図２２】本発明に係る吸音装置のさらに別の実施例を示す断面図である。

【図２３】本発明に係る吸音装置のさらに別の実施例を示す断面図で、（ａ）は軸線に沿って切断したもの、（ｂ）は軸線に直交する面で切断したものである。

【図２４】吸音装置の別の配置例を示す正面図で、（ａ）ないし（ｃ）は異なる態様を示している。

【符号の説明】

４０，４０Ａ，６０，６０Ａ，７０，１００，１３０，１４０　吸音装置

１５０，１６０　吸音装置

４４，６４，７４　空気層

４６，４６Ａ，６６，７６，１０４，１１０，１２０，１３６　吸音材

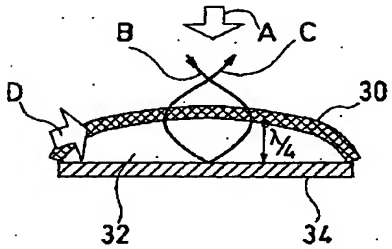
１４６，１５６，１６２　吸音材

１０２，１０８，１１６，１３４，１４４，１５４，１６６　セル

１０６，１３２，１４２，１５２，１６２　周囲部

１０７，１０９，１１９，１３３，１４３，１６３　底部

【図１】



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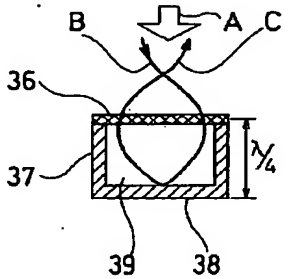

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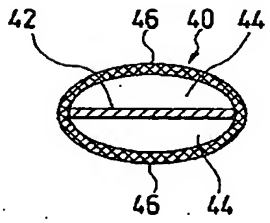

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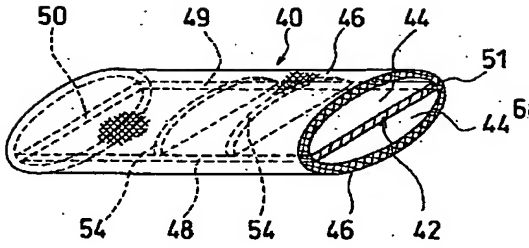

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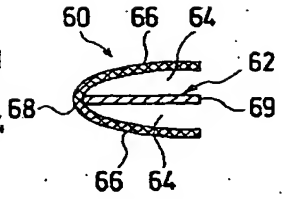

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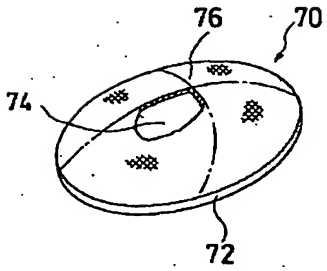

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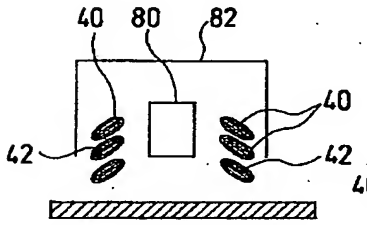

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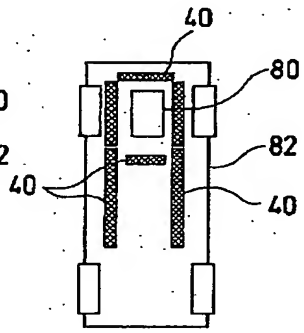

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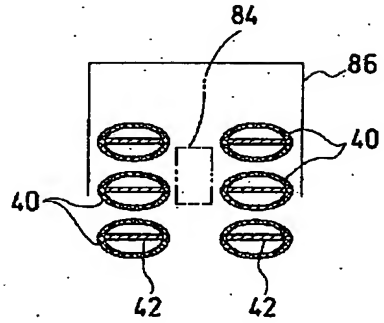

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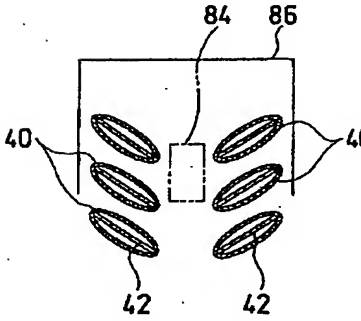

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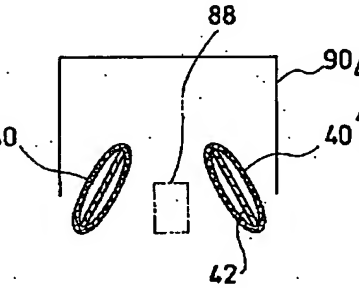

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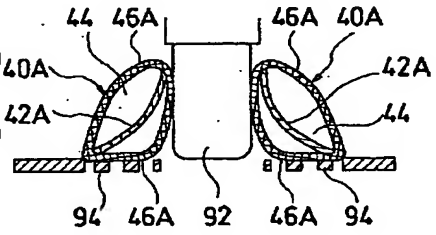

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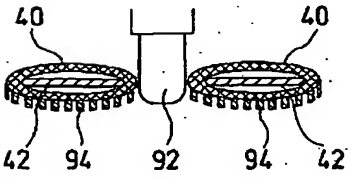

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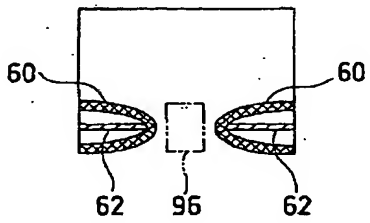

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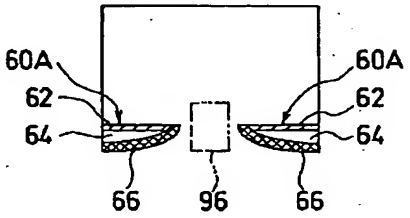

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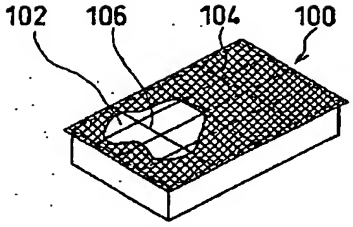

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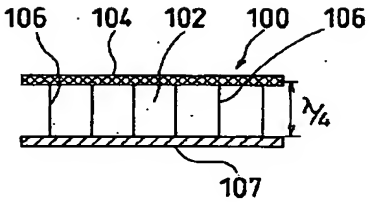

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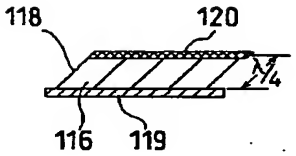

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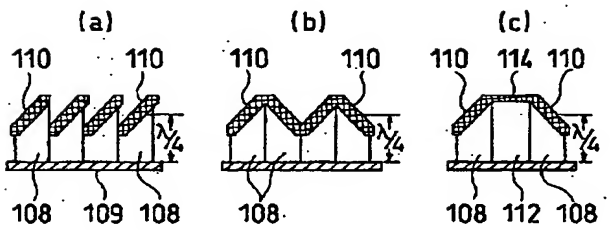

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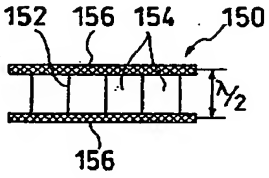

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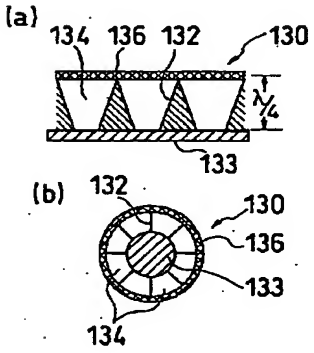

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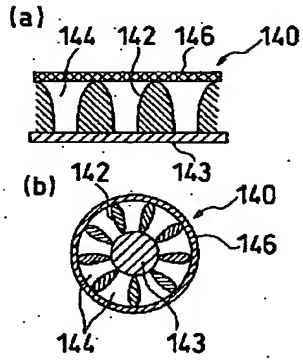

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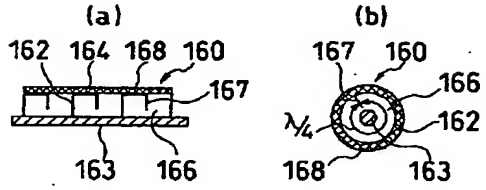

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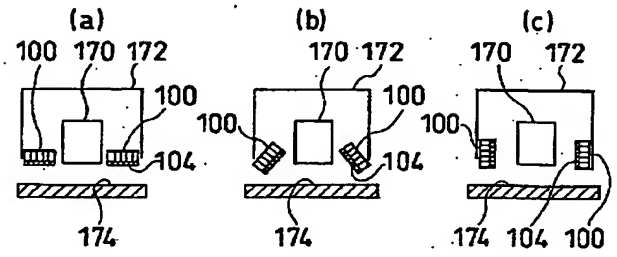

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The substrate with which a flat-surface configuration consists of a plate which presents a rectangle substantially and has the four sides, It is arranged over the two sides where this substrate counters, and has the acoustic material of said substrate intervened and located in one side in an air space at least. This acoustic material Noise absorption equipment which was formed in the curve configuration which curved so that it might separate from said substrate gradually as suitable [in the center between these two sides] from each of said two sides, and has been extended between the sides this curve configuration of whose is the two remaining.
[Claim 2] The substrate with which a flat-surface configuration consists of a plate which presents a rectangle substantially and has the four sides, It is arranged towards other neighboring upper parts or lower parts from one of the two sides where this substrate counters, and has the acoustic material of said substrate intervened and located in one side in an air space at least. This acoustic material Noise absorption equipment which was formed in the curve configuration which curved so that it might separate from said substrate gradually as other sides were turned to from one of said the two sides, and has been extended between the sides this curve configuration of whose is the two remaining.
[Claim 3] They are the substrate which consists of a plate, and noise absorption equipment which curved by being able to heap up from the periphery of this substrate and having the acoustic material of said substrate intervened and located in one side in an air space at least so that it might separate from said substrate gradually as this acoustic material is suitable in the center from said periphery.
[Claim 4] It is noise absorption equipment with which only the distance of the wave length of sound which should arrange a plate at the perimeter section and the pars basilaris ossis occipitalis, should be equipped with two or more cels formed considering the crowning as opening and the acoustic material arranged at said opening of each cel, and should absorb this acoustic material with this acoustic material which is substantially equivalent to a quadrant was formed by separating from said pars basilaris ossis occipitalis so that said opening might become small compared with said wavelength.
[Claim 5] Said opening is noise absorption equipment with which the acoustic material of said crowning and the acoustic material of said pars basilaris ossis occipitalis were formed by arranging a plate in the perimeter section and equipping two or more cels formed considering the crowning and the pars basilaris ossis occipitalis as opening, and said opening of each cel with the acoustic material arranged, respectively so that only the distance of the wave length of sound which should be absorbed with these acoustic material in which it is substantially equivalent to 1/2 might be detached and it might become small compared with said wavelength.
[Claim 6] It is the cel formed so that the plate which has opening might be arranged in the crowning and a cross-section configuration might present a round shape substantially to it, while arranging a plate at the perimeter section and the pars basilaris ossis occipitalis. It has the batch material which hangs from said crowning near the opening of said crowning, and is extended from said perimeter section to a core to radial. Two or more cels formed so that the sound which entered from said opening might spread to a circumferencial direction, might reflect by said batch material and might return to said opening, It is noise absorption equipment with which said opening and said batch material of said cel were formed by having the acoustic material arranged at said opening of each cel so that only the distance of the wave length of sound which should be absorbed with said acoustic

material in which it is substantially equivalent to a quadrant might be detached and said opening might become small compared with said wavelength.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the noise absorption equipment suitable for surrounding the engine of an automobile, absorbing sound the sound from an engine, absorbing sound the traffic noise which arranges along a highway and runs, or absorbing sound the sound which leaks to the sound or the exterior which attaches in the wall of a building and advances into the interior of a building, concerning noise absorption equipment.
[0002]
[Description of the Prior Art] While preparing the opening section in the shield surrounding the surroundings of an engine, the noise absorption equipment which attached inside the shield the acoustic material which curved to convex is proposed (JP,3-110959,U).
[0003]
[Problem(s) to be Solved by the Invention] Since said acoustic material is a fullness type, the acoustic material of a considerable amount is needed for acquiring predetermined effectiveness, and it is disadvantageous in cost.
[0004] This invention offers the noise absorption equipment which can do high effectiveness so with the acoustic material of a critical mass.
[0005]
[Means for Solving the Problem and its Function and Effect] A flat-surface configuration presents a rectangle substantially, and is arranged over the two sides where the substrate which consists of a plate which has the four sides, and this substrate counter, and the noise absorption equipment concerning this invention equips one side with the acoustic material of said substrate intervened and located in an air space at least. This acoustic material was formed in the curve configuration which curved so that it might separate from said substrate gradually as it was suitable in the center between these two sides from each of said two sides, and it is extended between the sides this curve configuration of whose is the two remaining.
[0006] When reaching acoustic material from the direction where an acoustic wave intersects acoustic material, an acoustic wave passes acoustic material and reaches a substrate through an air space. Then, it reflects with a substrate, acoustic material is again reached through an air space, and acoustic material is passed again. On the other hand, when an acoustic wave goes into acoustic material from a tangential direction, an acoustic wave comes out of acoustic material, after spreading the interior of acoustic material.
[0007] Since an air space is between a substrate and acoustic material, the amount of the acoustic material used can be lessened. By the way, the absorption-of-sound effectiveness of acoustic material becomes so high that the particle velocity of the acoustic wave which passes through the inside of acoustic material is quick, and becomes so high that the passage distance in acoustic material is long. Therefore, a curve configuration can be set from a substrate that the particle velocity of an acoustic wave becomes the quickest by the part which becomes the highest among the curve configurations of acoustic material, and it can deal in the highest absorption-of-sound effectiveness by installing noise absorption equipment so that the acoustic wave from a sound source may go into the part of acoustic material to which it becomes the highest from a normal substantially. Moreover, it can deal in the high absorption-of-sound effectiveness also by curving acoustic material smoothly

so that the acoustic wave which goes into acoustic material from a tangential direction may spread the inside of acoustic material for a long time as much as possible.
[0008] Since it is curving so that it may separate from a substrate gradually as acoustic material is suitable in the center between these two sides from each of the two sides, it can consider as a smooth curve. By this, it can deal in the good absorption-of-sound effectiveness over the large range from that it is easy to bring distance until the acoustic wave which passed acoustic material and was reflected with the substrate reaches acoustic material again from a substrate close to the distance to which the particle velocity of an acoustic wave becomes the quickest, and being extended between the sides whose curve configurations are two in which a substrate remains.
[0009] A flat-surface configuration presents a rectangle substantially, and is arranged towards other neighboring upper parts or lower parts again from one of the two sides where the substrate which consists of a plate which has the four sides, and this substrate counter, and the noise absorption equipment concerning this invention equips one side with the acoustic material of said substrate intervened and located in an air space at least. This acoustic material was formed in the curve configuration which curved so that it might separate from said substrate gradually as it turned to other sides from one of said the two sides, and it is extended between the sides this curve configuration of whose is the two remaining.
[0010] By this invention, although acoustic material does the same operation and effectiveness so substantially with the noise absorption equipment currently crossed to the two sides, when the sound source has become settled in the piece place, the futility of acoustic material is eliminated and it can absorb sound effectively further.
[0011] The noise absorption equipment concerning this invention can be heaped up again from the periphery of the substrate which consists of a plate, and this substrate, and equips one side with the acoustic material of said substrate intervened and located in an air space at least. This acoustic material is curving so that it may separate from said substrate gradually, as it is suitable in the center from said periphery.
[0012] A substrate is the configuration of a rectangle, a round shape or an ellipse form, and others, in being comparatively small, it heaps up acoustic material from the periphery of a substrate, noise absorption equipment is made, and it is independent, or two or more such independent noise absorption equipment is put in order, and it absorbs sound.
[0013] When using two or more independent noise absorption equipment, since the array can be selected to arbitration, it becomes easy to carry out absorption of sound according to a sound source. Moreover, like said invention, also to the acoustic wave which spreads acoustic material, the acoustic material of each noise absorption equipment is effective, and can absorb sound good also as opposed to the acoustic wave which passes acoustic material.
[0014] The noise absorption equipment concerning this invention arranges a plate at the perimeter section and the pars basilaris ossis occipitalis, and is equipped with two or more cels formed considering the crowning as opening, and the acoustic material arranged at said opening of each cel again. Only the distance of the wave length of sound which should absorb this acoustic material with this acoustic material which is substantially equivalent to a quadrant is separated from said pars basilaris ossis occipitalis, and it is formed so that said opening may become small compared with said wavelength.
[0015] The acoustic wave which passes through the inside of the cel of a small cross section compared with wavelength goes straight on, without causing reflection in the perimeter section, and turns into a plane wave. Therefore, it reflects only at the pars basilaris ossis occipitalis, and the acoustic wave which passed acoustic material and reached the pars basilaris ossis occipitalis through the air space in a cel reaches acoustic material through an air space again, and passes through this.
[0016] Although only the distance of the wave length of sound which this acoustic material should absorb which is substantially equivalent to a quadrant is separated from the pars basilaris ossis occipitalis, an acoustic wave is the part which serves as an antinode and vibrates, is the part in which the particle velocity of the acoustic wave reflected at the pars basilaris ossis occipitalis becomes the quickest, and this distance of acoustic material is a place where the energy of an acoustic wave is the highest. Acoustic material will decrease the highest energy effectively, and can absorb sound good. Moreover, since acoustic material is intervened and located in an air space, it can lessen the amount.

[0017] The noise absorption equipment concerning this invention arranges a plate in the perimeter section, and equips two or more cels formed considering the crowning and the pars basilaris ossis occipitalis as opening, and said opening of each cel with the acoustic material arranged, respectively again. Only the distance of the wave length of sound which should absorb the acoustic material of said crowning and the acoustic material of said pars basilaris ossis occipitalis with these acoustic material in which it is substantially equivalent to 1/2 is detached, and it is formed so that said opening may become small compared with said wavelength.
[0018] An acoustic wave goes straight on, without causing reflection in the perimeter section of a cel, and turns into a plane wave. Therefore, the part reflects the acoustic wave which passed a top acoustic material and reached the acoustic material of a pars basilaris ossis occipitalis through the air space in a cel only with the acoustic material of a pars basilaris ossis occipitalis, and the remainder passes the acoustic material of a pars basilaris ossis occipitalis. The acoustic wave which reflected with the acoustic material of a pars basilaris ossis occipitalis, and reached a top acoustic material through the air space again passes through this.
[0019] Although it is mutually separated from the acoustic material of a crowning and a pars basilaris ossis occipitalis of the distance of the wave length of sound which these acoustic material should absorb which is substantially equivalent to 1/2, in this case, an acoustic wave carries out vibration which serves as an antinode at a crowning and the pars basilaris ossis occipitalis, and particle velocity becomes the quickest in that antinode. Consequently, the acoustic material of a crowning and a pars basilaris ossis occipitalis will decrease the highest energy of an acoustic wave effectively, and can absorb sound good. Moreover, since acoustic material is intervened and located in an air space, it can lessen the amount.
[0020] While the noise absorption equipment concerning this invention arranges a plate at the perimeter section and the pars basilaris ossis occipitalis, again Are the cel formed so that the plate which has opening might be arranged in the crowning and a cross-section configuration might present a round shape substantially to it, and it hangs from said crowning near the opening of said crowning. And it has the batch material extended from said perimeter section to a core to radial, and the sound which entered from said opening spreads to a circumferencial direction, and it reflects by said batch material, and has two or more cels formed so that it might return to said opening, and the acoustic material arranged at said opening of each cel. Only the distance of the wave length of sound which should absorb said opening and said batch material of said cel with said acoustic material in which it is substantially equivalent to a quadrant is detached, and said opening is formed so that it may become small compared with said wavelength.
[0021] It is expectable that the acoustic wave which passes through the inside of the circular cel which has small opening compared with wavelength goes straight on, without causing reflection in the perimeter section, and turns into a plane wave. Therefore, it reflects only by batch material, and the acoustic wave which passed acoustic material and reached batch material through the air space in a cel reaches acoustic material through an air space again, and passes through this.
[0022] Although only the distance of the wave length of sound which this acoustic material should absorb which is substantially equivalent to a quadrant is separated from batch material, an acoustic wave is the part which serves as an antinode and vibrates, is the part in which the particle velocity of the acoustic wave reflected by batch material becomes the quickest, and this distance of acoustic material is a place where the energy of an acoustic wave is the highest. Acoustic material will decrease the highest energy effectively, and can absorb sound good. Moreover, since acoustic material is intervened and located in an air space, it can lessen the amount.
[0023]
[Embodiment of the Invention] First, the principle of this invention is explained with reference to typical drawing 1 and typical drawing 2 . If the incident wave B of the acoustic wave which is advancing in the direction of A reaches acoustic material 30, an incident wave B will pass acoustic material 30, and will reach a substrate 34 through an air space 32. Then, it reflects with a substrate 34, and an incident wave B turns into a reflected wave C, reaches acoustic material 30 through an air space 32 again, and passes acoustic material 30. When an acoustic wave reflects with a substrate 34, the acoustic wave vibrates so that the antinode of vibration may come to the part which is equivalent to the quadrant of wavelength lambda from a substrate 34, and the particle velocity of the acoustic

wave in an antinode becomes the quickest. Since this is that the acoustic wave has big energy, if acoustic material 30 is made to pass an acoustic wave here, it can carry out big attenuation to an acoustic wave.

[0024] Next, if the acoustic wave which is advancing in the direction of D carries out incidence to acoustic material 30 from a tangential direction, an acoustic wave will spread the inside of acoustic material 30, if acoustic material 30 is curving smoothly. Therefore, if the curve configuration of acoustic material 30 is set that an acoustic wave advances the inside of acoustic material 30 as much as possible for a long time, big attenuation can be carried out to an acoustic wave. Usually, radii are suitable for this.

[0025] As shown in drawing 2 , when the incident wave B of the acoustic wave which is advancing in the direction of A passes acoustic material 36 and passes through the inside of the cel 37 of a small cross section compared with the wavelength of an acoustic wave further, an incident wave goes straight on, without causing reflection in the perimeter section of a cel 37, and turns into a plane wave. Therefore, it reflects only at the pars basilaris ossis occipitalis 38, and the incident wave B which passed acoustic material 36 and reached the pars basilaris ossis occipitalis 38 through the air space 39 in a cel turns into a reflected wave C, and reaches acoustic material 36 through an air space 39 again. When an acoustic wave reflects at the pars basilaris ossis occipitalis 38, as the acoustic wave was mentioned above, it vibrates so that the antinode of vibration may come to the part which is equivalent to the quadrant of wavelength lambda from a pars basilaris ossis occipitalis 38, and the particle velocity of the acoustic wave in an antinode becomes the quickest. Since this is that the acoustic wave has big energy, if acoustic material 36 is made to pass an acoustic wave here, it can carry out big attenuation to the acoustic wave which advances in the direction of A.

[0026] A flat-surface configuration will present a rectangle substantially, and will be arranged over the two sides where the substrate 42 which consists of a plate which has the four sides, and a substrate 42 counter, and noise absorption equipment 40 will equip one side with the acoustic material 46 of a substrate 42 intervened and located in an air space 44 at least, if drawing 3 of a cross-section condition and drawing 4 of a strabism condition are referred to.

[0027] In the example of illustration, a substrate 42 consists of a rectangular hard plate, and has the four sides 48, 49, 50, and 51. A substrate 42 can be made from a metal like the rigid resin or the steel plate like polypropylene, and an aluminum plate. Two acoustic material 46 is arranged over the two sides 48 and 49. Each acoustic material 46 was formed in the curve configuration which curved so that it might separate from a substrate 42 gradually as it was suitable in the center between these two sides from each of the two sides 48 and 49, and it is extended between the side 50 this curve configuration of whose is the two remaining, and 51. That is, between the two sides 50 and 51, acoustic material 46 is the same configuration substantially by every part. To the substrate 42, two acoustic material 46 is symmetry configurations, and serves as radii which used the substrate 42 as the bowstring. Acoustic material 46 fabricated a well-known ingredient like glass wool in itself, it was formed so that it might paste up suitably and a configuration could be maintained, it is pasted up or ****ed and a stop is carried out to a substrate 42. The felt or a thing like urethane can also be used as an acoustic material 46. The thickness of acoustic material 46 is ten to 30 mm. It can set to extent.

[0028] The center of the thickness of the acoustic material in the part to which acoustic material 46 separated from the substrate 42 most has determined that a dimension becomes the distance of lambda/4 from the front face of a substrate 42. Here, lambda is the wave length of sound which should be absorbed with acoustic material 46. It is desirable to attach two or more dashboards 54 in the air space 44 between acoustic material 46 and a substrate 42 so that these dashboards may be arranged at equal intervals between the two sides 50 and 51. A dashboard 54 can be made from rigid resin or a metal. This achieves the configuration maintenance function of acoustic material 46, and the function to prepare the flow of a sound.

[0029] A flat-surface configuration presents a rectangle substantially, and the noise absorption equipment 60 shown in drawing 5 in the state of the cross section is arranged towards the upper part of the side 69 or the lower part of others [68] one of the two sides 68 and 69 where the substrate 62 which consists of a plate which has the four sides, and this substrate counter, and equips one side with the acoustic material 66 of a substrate 62 intervened and located in an air space 64 at least. A substrate 62 is a rectangular thing like the substrate 42 of drawing 4 .

[0030] In the example of illustration, two acoustic material 66 is arranged at the upper part of a substrate 62, and a lower part. Each acoustic material 66 was formed in the curve configuration which curved so that it might separate from a substrate 62 gradually as it was suitable other sides 69 from one [68] of the two sides 68 and 69 of a substrate 62, and it is extended in the direction perpendicular to between the sides this curve configuration of whose is the two remaining (i.e., the space of drawing 5). The dimension is set that the distance from the front face of the substrate 62 by the side of the side 69 to the center of the thickness of acoustic material 66 is set to lambda/4. Here, lambda is the wave length of sound which should be absorbed with acoustic material 66. A substrate 62 and acoustic material 66 can be formed with the same ingredient as what was mentioned above.
[0031] The noise absorption equipment 70 of drawing 6 shown in the state of strabism can be heaped up from the periphery of the substrate 72 which consists of a plate, and a substrate 72, and equips one side with the acoustic material 76 of a substrate 72 intervened and located in an air space 74 at least. Acoustic material 76 is curving so that it may separate from a substrate 72 gradually, as it is suitable in the center from said periphery. A substrate 72 and acoustic material 76 can be formed with the same ingredient as what was mentioned above.
[0032] In the example of illustration, a substrate 72 is a disk and acoustic material 76 has become arched roof-like, the shape of i.e., a dome, in the upper part of a substrate 72. Acoustic material 76 has set the dimension that the distance from a substrate 72 to the center of the thickness of acoustic material 76 is set to lambda/4 from a substrate 72 in the most distant part. Here, lambda is the wave length of sound which should be absorbed with acoustic material 76. A substrate 72 can be replaced with a disk and can be made into the configuration of a rectangle, an ellipse form, and others. There is such no sequence at the noise absorption equipment of drawing 6 to standing in a row covering die length with the curve configuration of acoustic material in the noise absorption equipment shown in drawing 3 thru/or drawing 5 .
[0033] Noise absorption equipment 40 can be used arranging, as shown in drawing 7 thru/or drawing 13 . Reference of drawing 8 which shows drawing 7 and the flat-surface condition which show a transverse-plane condition arranges noise absorption equipment 40 in the engine room 82 that the sound from an engine 80 should be absorbed sound. Although noise absorption equipment 40 is arranged in vertical 3 train, respectively left-hand side and on the right-hand side of an engine 80, a left-hand side array and a right-hand side array make noise absorption equipment 40 slanting so that a substrate 42 may serve as facing up to an engine 80, and serve as symmetry. Furthermore, noise absorption equipment 40 is arranged also before and after the engine 82.
[0034] If drawing 9 which shows a transverse-plane condition is referred to, noise absorption equipment 40 surrounds the sound from a sound source 84 that it should absorb sound, and is arranged in 86. Although noise absorption equipment 40 is arranged in vertical 3 train, respectively left-hand side and on the right-hand side of a sound source 84, a left-hand side array and a right-hand side array level noise absorption equipment 40 so that a substrate 42 may become level, and serve as symmetry.
[0035] If drawing 10 which shows a transverse-plane condition is referred to, noise absorption equipment 40 surrounds the sound from a sound source 84 that it should absorb sound, and is arranged in 86. Although noise absorption equipment 40 is arranged in vertical 3 train, respectively left-hand side and on the right-hand side of a sound source 84, a left-hand side array and a right-hand side array make noise absorption equipment 40 slanting so that a substrate 42 may serve as facing down to a sound source 84, and serve as symmetry.
[0036] If drawing 11 which shows a transverse-plane condition is referred to, noise absorption equipment 40 surrounds the sound from a sound source 88 that it should absorb sound, and is arranged in 90. Although noise absorption equipment 40 is arranged in one train, respectively left-hand side and on the right-hand side of a sound source 88, a left-hand side array and a right-hand side array make noise absorption equipment 40 slanting so that a substrate 42 may receive a sound source 88 and may serve as facing up, and serve as symmetry.
[0037] If drawing 12 which shows a transverse-plane condition is referred to, a sound source 92 is an oil pan mechanism with the engine bottom, and noise-absorption-equipment 40A is arranged in one train at the flank of right and left of an oil pan mechanism 92, respectively. Noise-absorption-equipment 40A is the gestalt which changed noise absorption equipment 40, and it differs in that

substrate 42A is formed with the gum ingredient by the point equipped with substrate 42A, an air space 44, and acoustic-material 46A although it is the same as noise absorption equipment 40. Since substrate 42A is a gum ingredient, noise-absorption-equipment 40A has flexibility in the whole. Therefore, in the example of illustration, the whole noise-absorption-equipment 40A is contacted to an oil pan mechanism 92, and bending and acoustic-material 46A is arranged in it. It is desirable to arrange a punching metal 94 to the noise-absorption-equipment 40A down side, and to protect noise-absorption-equipment 40A.

[0038] If drawing 13 which shows a transverse-plane condition is referred to, a sound source 92 is an oil pan mechanism, and noise absorption equipment 40 is arranged so that a substrate 42 may become level at the flank of right and left of an oil pan mechanism 92 at one train, respectively. It is desirable to arrange a punching metal 94 to the noise-absorption-equipment 40 down side.

[0039] Noise absorption equipment's 60 reference of drawing 14 which shows a transverse-plane condition arranges it at the flank of right and left of a sound source 96, respectively so that a substrate 62 may become level at one train, so that it may become symmetrical to a sound source 96. When a sound source 96 is comparatively small, compared with the case where noise absorption equipment 40 is used, the amount of acoustic material can be reduced by using noise absorption equipment 60. When drawing 14 is compared with drawing 13 , as for noise absorption equipment 60, it turns out [of noise absorption equipment 40] that can be mostly carried out to half magnitude.

[0040] Although noise-absorption-equipment 60A is the gestalt which changed noise absorption equipment 60 and it is the same as noise absorption equipment 60 at a point equipped with a substrate 62, an air space 64, and acoustic material 66 if drawing 15 which shows a transverse-plane condition is referred to, in noise-absorption-equipment 60A, acoustic material 66 is formed only under the substrate 62. Noise-absorption-equipment 60A is arranged at the flank of right and left of a sound source 96, respectively so that a substrate 62 may become level at one train and acoustic material 66 may serve as the bottom, so that it may become symmetrical to a sound source 96.

[0041] It replaces with arrangement of drawing 14 and drawing 15 , and it is possible to make it the arrangement shown in drawing 7 and drawing 9 thru/or drawing 11 , and it can also consider as arrangement of drawing 12 by making a substrate 62 from a gum ingredient further.

[0042] Noise absorption equipment 70 is attached in the sound-proof wall built for example, along a driveway in the condition of having made the substrate 72 close to a sound-proof wall, and the a large number array of it can be carried out along a road, and it can arrange and use such noise absorption equipment for two or more trains in the vertical direction of a sound-proof wall further.

[0043] The noise absorption equipment 100 shown in drawing 16 of a strabism condition and drawing 17 of a cross-section condition arranges a plate at the perimeter section and the pars basilaris ossis occipitalis, and is equipped with two or more cels 102 formed considering the crowning as opening, and the acoustic material 104 arranged at said opening of each cel. Only the distance of the wave length of sound which should absorb acoustic material 104 with this acoustic material which is substantially equivalent to a quadrant is separated from the pars basilaris ossis occipitalis. And said opening is formed so that it may become small compared with said wavelength.

[0044] In the example of illustration, a cel 102 is the gestalt which used the perimeter section 106 as the square cylinder, and attached the pars basilaris ossis occipitalis 107. Such a cel 102 is arranged two-dimensional horizontally, acoustic material 104 is arranged to top opening, and noise absorption equipment 100 is formed. Acoustic material 104 is located so that the distance from the front face of a pars basilaris ossis occipitalis 107 to the center of the thickness of acoustic material 104 may serve as a quadrant of wavelength lambda. The perimeter section 106 and a pars basilaris ossis occipitalis 107 can carry out injection molding of the rigid resin, and can obtain it. When the frequency of the sound which should absorb acoustic velocity with 340m / s, and acoustic material is set to 1000Hz, since the wave length of sound is 34cm, die length of one side of the perimeter section 106 of a cel 102 can be set to 1/5 of wavelength thru/or about 1/10.

[0045] Acoustic material 104 can define this dimension as follows according to the configuration of opening, although only the distance of wave-length-of-sound lambda which should be absorbed with this acoustic material which is substantially equivalent to a quadrant is separated from the pars basilaris ossis occipitalis. As shown in drawing 18 , when a cel 108 has slanting opening, acoustic

material 110 is arranged aslant. In this case, the midpoint of the die length of acoustic material 110 should just be in said distance from a pars basilaris ossis occipitalis 109. Although the acoustic material 114 prepared in this middle cel 112 separates from said distance when there is a middle cel 112, as shown in this drawing (c), the acoustic material 110 attached in the cel 108 of both sides is set to said distance. As shown in drawing 19 , when the perimeter section 118 which forms a cel 116 is inclined and extended from the pars basilaris ossis occipitalis 119, acoustic material 120 determines that the true length of the perimeter section 118, i.e., the die length of the perimeter section 118 from a pars basilaris ossis occipitalis 119 to acoustic material 120, becomes said distance.

[0046] The noise absorption equipment 130 shown in drawing 20 of a cross-section condition arranges a plate at the perimeter section 132 and the pars basilaris ossis occipitalis 133, and is equipped with two or more cels 134 formed considering the crowning as opening, and the acoustic material 136 arranged at said opening of each cel. Only the distance of the wave length of sound which should absorb acoustic material 136 with this acoustic material which is substantially equivalent to a quadrant is separated from the pars basilaris ossis occipitalis 133. And said opening is formed so that it may become small compared with said wavelength. Noise absorption equipment 130 is cylindrical to the whole, and is extended in the direction perpendicular to the space of drawing 20 . And the cel 134 is divided by the perimeter section 132 also in the direction perpendicular not only to the hoop direction of this drawing (a) but space. The cross section is formed in the shape of a triangle, and, as for the perimeter section 132, opening serves as a tip.

[0047] The noise absorption equipment 140 shown in drawing 21 of a cross-section condition arranges a plate at the perimeter section 142 and the pars basilaris ossis occipitalis 143, and is equipped with two or more cels 144 formed considering the crowning as opening, and the acoustic material 146 arranged at said opening of each cel. Only the distance of the wave length of sound which should absorb acoustic material 146 with this acoustic material which is substantially equivalent to a quadrant is separated from the pars basilaris ossis occipitalis 143. And said opening is formed so that it may become small compared with said wavelength. Noise absorption equipment 140 is cylindrical to the whole, and is extended in the direction perpendicular to the space of drawing 21 . And the cel 144 is divided by the perimeter section 142 also in the direction perpendicular not only to the hoop direction of this drawing (a) but space. As for the perimeter section 142, the cross section is substantially formed in elliptical. In the noise absorption equipment of drawing 20 and drawing 21 , since opening of a cel is large, a sound tends to go into noise absorption equipment.

[0048] The noise absorption equipment 150 shown in drawing 22 of a cross-section condition arranges a plate in the perimeter section 152, and equips two or more cels 154 formed considering the crowning and the pars basilaris ossis occipitalis as opening, and said opening of each cel with the acoustic material 156 arranged, respectively. Only the distance of the wave length of sound which should absorb the top acoustic material 156 and the acoustic material 156 of a pars basilaris ossis occipitalis with these acoustic material in which it is substantially equivalent to 1/2 is detached, and it is formed so that said opening may become small compared with said wavelength. Many cels 154 are superficially put in order like the cel 102 of the noise absorption equipment 100 shown in drawing 16 . With this gestalt, since the acoustic wave which passed one acoustic material serves as vibration whose antinode of vibration comes to two acoustic material 156, it can absorb effectively the energy which the particle velocity of the acoustic wave which became the quickest has by setting to the distance which described above between two acoustic material 156.

[0049] The noise absorption equipment 160 shown in drawing 23 of a cross-section condition is equipped with two or more cels 166 formed so that the plate 164 which has opening might be arranged in the crowning and a cross-section configuration might present a round shape substantially to it, and the acoustic material 168 arranged at opening of each cel while it arranges a plate at the perimeter section 162 and the pars basilaris ossis occipitalis 163. A cel 166 has the batch material 167 which hangs from a plate 168 near the opening of said plate 168, and is extended from the perimeter section 162 to a core to radial, and the sound which entered from said opening spreads to a circumferencial direction, and it reflects by the batch material 167, and it is formed so that it may return to said opening. Only the distance of the wave length of sound which should absorb said opening and batch material 167 of a cel 166 with acoustic material 168 in which it is substantially

equivalent to a quadrant is detached, and said opening is formed so that it may become small compared with said wavelength. In this mode, noise absorption equipment 160 is formed in the whole in the shape of a cylinder. The cross-section configuration of a cel 166 is circular, and since a pars basilaris ossis occipitalis 163 is located at the core of a circle, it can be determined that the circumferencial direction die length in the midpoint of distance which results in the perimeter section 162 serves as a quadrant of wavelength from a pars basilaris ossis occipitalis 163.

[0050] The noise absorption equipment 100 shown in drawing 16 can be used arranging it like drawing 24 . In this drawing (a), noise absorption equipment 100 is arranged horizontally in an engine room 172 by each flank of an engine 170, and it is located so that acoustic material 104 may meet a road surface 174. In this drawing (b), noise absorption equipment 100 is aslant arranged in an engine room 172 by each flank of an engine 170, and it is located so that acoustic material 104 may incline and meet an engine 170 and a road surface 174. In this drawing (c), noise absorption equipment 100 is arranged in an engine room 172 by each flank of an engine 170 at a vertical, and it is located so that acoustic material 104 may meet an engine 170.

[0051] Cylindrical noise absorption equipment 130,140,160 can be arranged like drawing 24 . In this case, noise absorption equipment can be arranged so that that axis may serve as a cross direction of a car body, the cross direction of a car body, or the direction of a vertical, and two or more such noise absorption equipment can be arranged to a cross direction. Moreover, when arranging so that an axis may serve as a cross direction of a car body, or the cross direction, it can arrange in two or more trains in the vertical direction or the direction of a vertical.

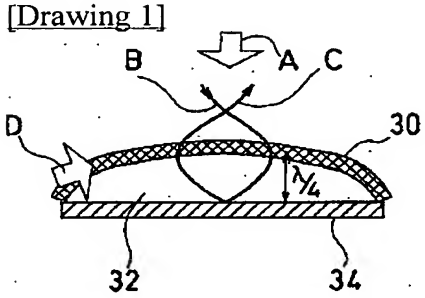
[Translation done.]

* NOTICES *

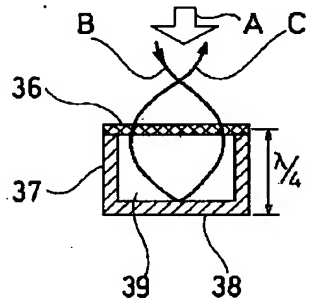
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



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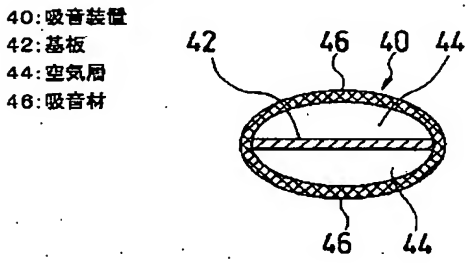
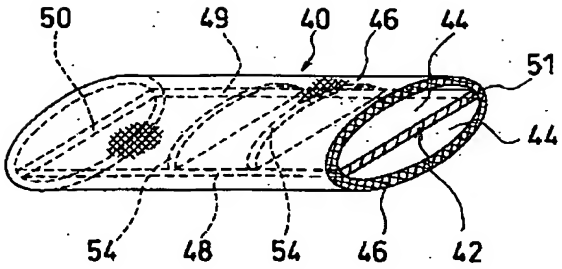


[Drawing 4]



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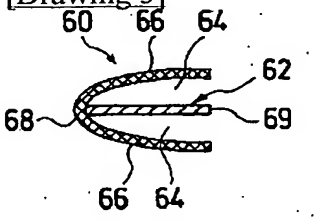

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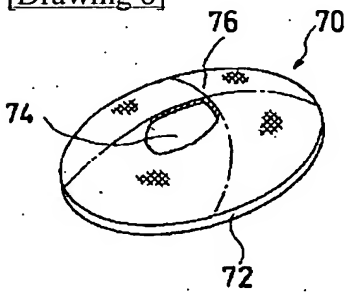

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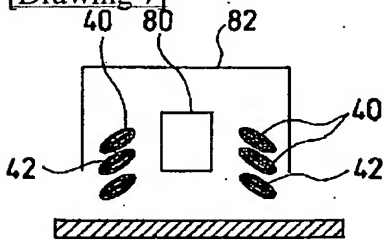

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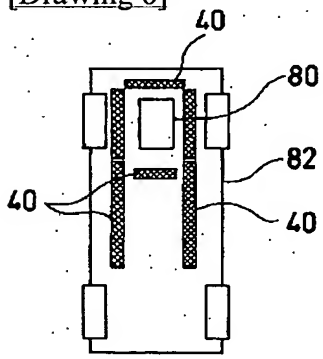

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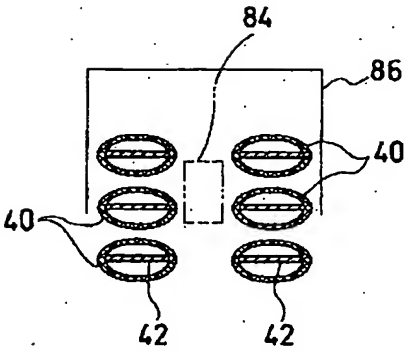

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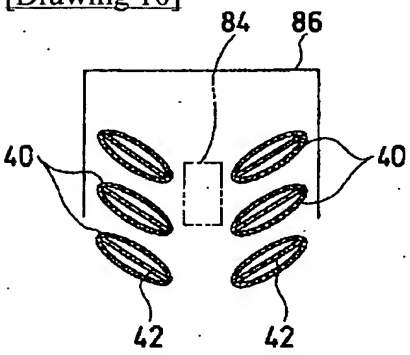

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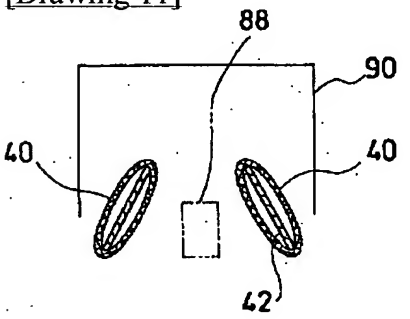

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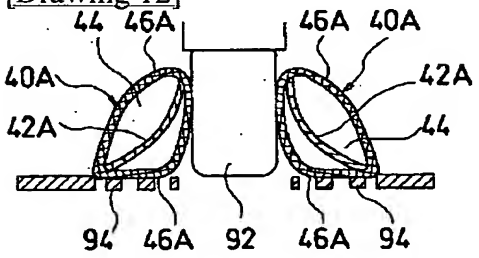
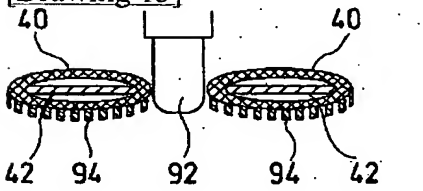
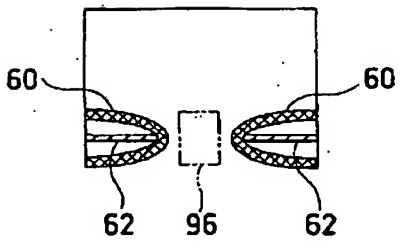


[Drawing 13]



[Drawing 14]



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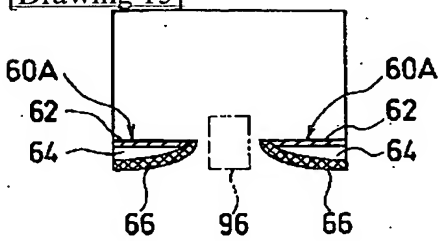
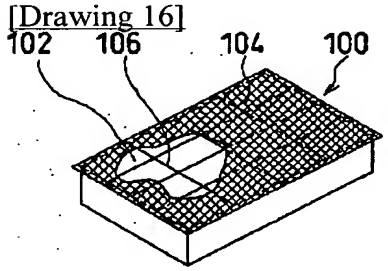
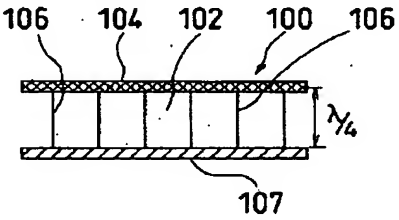


[Drawing 16]



[Drawing 17]



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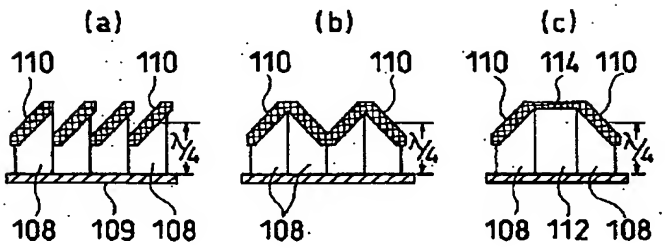
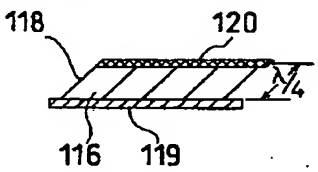


[Drawing 19]



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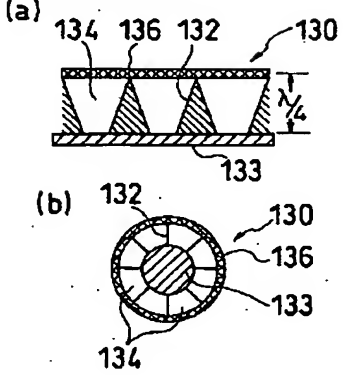

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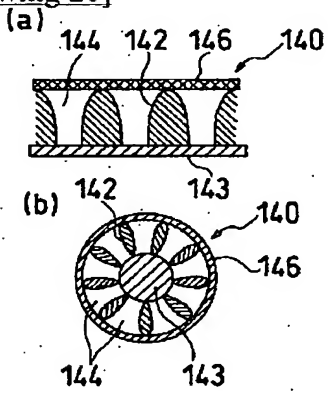

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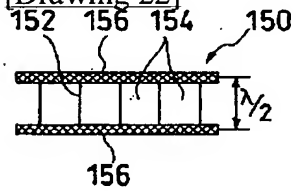

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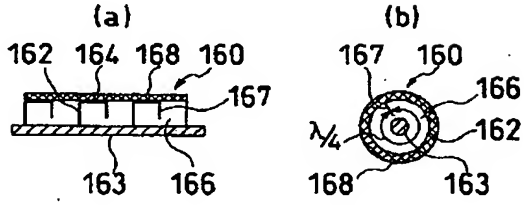
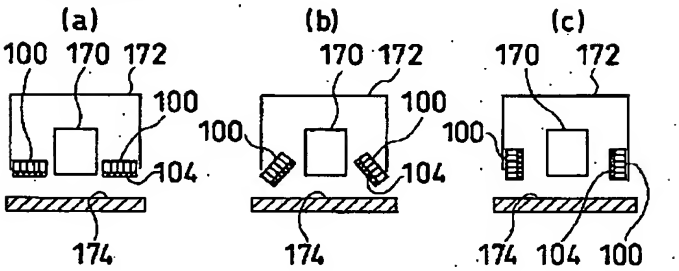


[Drawing 24]



[Translation done.]